

Timing Control Unit

TCU-50

WARRANTY

DIGITAL PATHWAYS, INC. hereby warrants each of its products to be free from defects in materials and/or workmanship for a period of 90 days from date of purchase. In the event of the occurrence of malfunction, or other indication of failure attributable directly to faulty workmanship and/or material, then upon return of the product to Digital Pathways, Inc. at 4151 Middlefield Road, Palo Alto, CA 94306 (postage prepaid), DPI will, at its option, repair or replace said products or components to whatever extent DPI shall deem necessary, to restore said product to proper operating condition. All such repairs or replacements shall be made by DPI, without charge to the customer.

This warranty contains the limits of responsibility of DPI, with regard to its products, and no other liability is expressed, implied, or should be assumed by the purchaser.

GENERAL DESCRIPTION

The Digital Pathways Timing Control Unit (TCU-50) is a self supporting time keeper designed to operate in a peripheral slot of the LSI-11 system.

- The Timing Control Unit is fully operational when it arrives at your premises and can be interrogated by the computer to give you the:
 - a) month and day
 - b) hour and minute
 - c) second
- The TCU continues to operate on its own rechargeable battery power, with the computer off, for a period of up to three months.

- The TCU is initialized by simple commands from the computer.
- TCU addresses are determined by jumpers.

INTERROGATING THE TCU

The date and time are available to the user by simply addressing the TCU with 76XXX0 for month/day, 76XXX2 for hour/minute and 76XXX4 for seconds. Figure 1 illustrates the address field used by the timer. No sequence of operation is required: any one of the three addresses will present the user with the date/time as a binary number.

You may want to interrogate the "ready bit (7)" of the status register (address 76XXX6) before reading the timer. The ready bit is in the 0 state only during the "set month/day, hour/minute" operation and is 1 at all other times.

INITIALIZING THE TCU

Initialization of the TCU-50 to the correct date and time is accomplished by means of the three "commands" SET MONTH/DAY, SET HOUR/MINUTE and RESET FAST CLOCK, and a very simple software routine. Each of these commands is issued to the TCU-50 by writing any word into the appropriate address as listed in Figure 1.

The effect of the SET MONTH/DAY command is to make the MONTH/DAY counters cycle rapidly through all possible days and months in sequence.

The effect of the SET HOUR/MINUTE command is to make the HOUR/MINUTE counters cycle rapidly through all possible minutes and hours, in sequence.

		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
76XXX0	READ MONTH/DAY	X	X	X	X	MONTH				X	X	X	DAY				
	SET MONTH/DAY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX2	READ HOUR/MINUTES	X	X	X	HOUR				X	X	MINUTE						
	SET HOUR/MINUTES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX4	READ SECONDS	X	X	X	X	X	X	X	X	X	SECOND						
	RESET FAST CLOCK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
76XXX6	READ STATUS	REFER TO FIGURE 2															

Figure 1. Word Format

The effect of the RESET FAST CLOCK command is to turn off the rapid cycling of either the MONTH/DAY counters or the HOUR/MINUTE counter. If it turns off the HOUR/MINUTE counters then it automatically zeros the SECOND counter.

The procedure then for initializing either the MONTH/DAY or HOUR/MINUTE counter is as follows:

1. Write the value desired in the correct format into some storage register in the LSI-11.
2. Issue either the SET MONTH/DAY or SET HOUR/MINUTE command as appropriate.
3. Enter a software loop in which you compare the contents of your storage register with the MONTH/DAY or HOUR/MINUTE values as read from either Address 76XXX0 or 76XXX2, respectively.
4. When the comparison is true, issue the RESET FAST CLOCK command.

As long as your software loop takes less than 35 microseconds for execution, the value set in the TCU-50 will now equal the desired value.

A sample software routine is given below. The entire procedure takes less than 50 milliseconds.

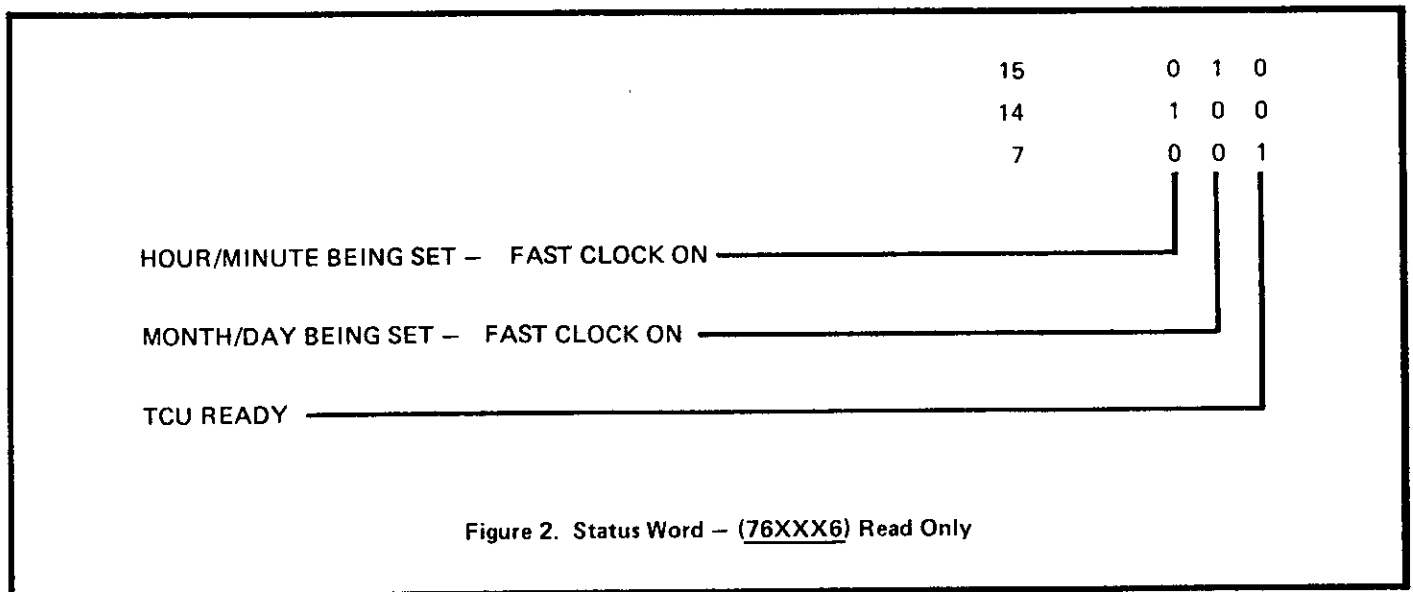
SAMPLE PROGRAM

28.

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Set the TCU TO August 26.
START: MOV #4034,R0      August 26
        MOV #76XXX0,R1   Device Address
        MOV R0,(R1)      Starts fast clock

AGIN:   CMP (R1),R0
        BNE AGIN
        MOV R0,@#76XXX4 Resets fast clock
        CMP (R1),R0     Is the correct date set?
        BNE START      Try again
        HLT              Date correct
    
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SPECIFICATIONS

- Battery power - three 150 mAH Nickel Cadium
- Operating life, without computer power - three months*
- Accuracy - ±5 seconds per month*
- Current LSI-11 on - 400 mA @ +5 volts*
- Current LSI-11 off - 20 μA @ +3.5 volts*
- TCU requires four addresses
- Operating temperature - 0-50°C
- TCU address selected via jumpers

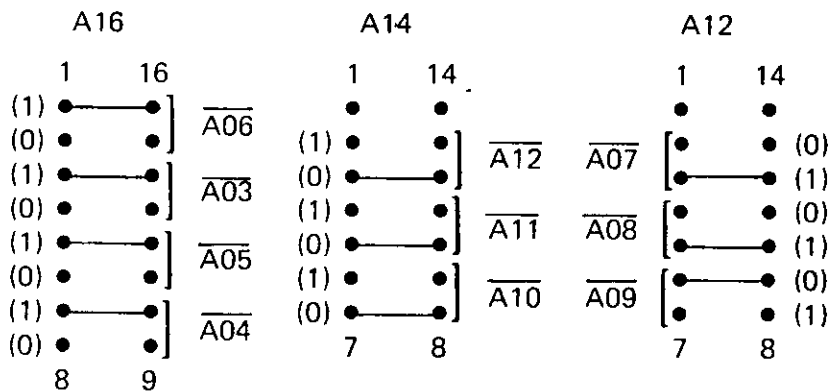
*at 40°C

TCU-50 JUMPERS

FRONT

3 BATTERIES

DEVICE ADDRESS (76077X)



DIGITAL PATHWAYS INC.

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